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ABSTRACT

The present experiment tested the hypothesis that effort attribution given for prior achievement is effective in promoting subsequent achievement behaviors. Forty children drawn from two elementary schools and lacking in subtraction skills received training and opportunities to solve subtraction problems. In the context of training, children received effort attribution for prior achievement, attribution for future achievement, or no attribution. Results showed that attribution for prior achievement led to more rapid training progress, greater skill development, higher percepts of self-efficacy, and more accurate self-appraisal of capabilities. In contrast, attribution for future achievement did not influence children's achievement outcomes. The results demonstrate important differences in outcomes as a result of how effort is linked with achievement. Effort attribution may have complex effects including the possibilities that the two forms of attribution differ in: (1) social reinforcement value; and (2) the type of performance feedback they provide to children. A third complexity relates to the idea that effort attribution is most effective with tasks perceived as intermediate in difficulty. The need for future research clarifying how these effects occur is suggested. (Author/RL)

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Effort Attribution:
The Direction Makes a Difference

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Abstract

The present experiment tested the hypothesis that effort attribution given for prior achievement is effective in promoting subsequent achievement behaviors. Children who lacked subtraction skills received training and opportunities to solve subtraction problems. In the context of training, children received effort attribution for prior achievement, attribution for future achievement, or no attribution. Results showed that attribution for prior achievement led to more rapid training progress, greater skill development, higher percepts of self-efficacy, and more accurate self-appraisal of capabilities. In contrast, attribution for future achievement did not influence children's achievement outcomes. The results demonstrate important differences in outcomes as a result of how effort is linked with achievement, but also suggest the need for future research clarifying how these effects occur.

Effort Attribution:

The Direction Makes a Difference

Attributional theories postulate that individuals utilize information to arrive at causal ascriptions for task outcomes (Heider, 1958; Weiner, Frieze, Kukla, Reed, Rest, & Rosenbaum, 1971), and that among the more common causal ascriptions in achievement settings are ability, effort, and task difficulty (Weiner, 1979). In turn, individuals are likely to expect the same outcomes with increased certainty given the expectation that future task conditions will remain relatively constant (Weiner, 1980).

The role of effort has been emphasized by many investigators, in part because unlike ability or task difficulty, effort is under volitional control and amenable to change. Persons who ascribe failure primarily to a lack of effort are more likely to believe they can succeed in the future than persons who ascribe failure more to a lack of ability or high task difficulty. Conversely, success attributed largely to great effort may result in a weaker expectation of future success than success ascribed mainly to high ability or task ease (Weiner, 1980).

Personal expectations of success and failure should manifest themselves behaviorally. In Bandura's theory of self-efficacy (Bandura, 1977, in press), psychological procedures change behavior in part by strengthening perceived self-efficacy, which is concerned with personal judgments of one's capability to perform given activities. To the extent that effort attribution promotes percepts of self-efficacy, persons should be more likely to engage in the activity, expend greater effort, and persist in the face of difficulty. Research

has shown that stressing effort in connection with prior outcomes results in greater persistence (Andrews & Debus, 1978; Chapin & Dyck, 1976; Dweck, 1975).

The foregoing considerations suggest that effort attribution could prove valuable in promoting a variety of achievement behaviors. One purpose of the present study, therefore, was to determine whether effort attribution leads to the type of sustained task involvement necessary to facilitate children's achievement behaviors when these are initially lacking. Attributing achievements to effort should be viewed as highly valid by children since effort is often included in children's explanations of academic successes (Frieze & Snyder, 1980). One would therefore expect attribution to heighten and sustain task involvement, which in turn should promote other achievement behaviors such as skillful performance, persistence, and judgments of self-efficacy.

Within this context, effort attribution may be differentially effective depending on how it is linked to achievement. One can believe that prior achievement was due to effort or that future achievement will occur through hard work. While both forms of effort attribution have been used in concert in previous research (Chapin & Dyck, 1976; Schunk, in press), their implications may differ. As noted above, attributing prior achievement to effort should be perceived as valid and lead to salutary effects on achievement behaviors. However, attributing future achievement to effort must be personally validated; one must subsequently expend greater effort and perceive that it leads to greater achievement. If this covariation does not occur, children may doubt the effectiveness of added effort, and may not show more subsequent task involvement. In support of this idea, Covington and Omelich (1979) found that students preferred being thought of as expending less rather than more effort

when they failed at a task, presumably because failure despite great effort implicates low ability.

A second purpose of the present study was to examine the effects of effort attribution on self-appraisal, defined as the correspondence between judgments of self-efficacy and actual achievement. Accurate self-appraisal is important because mismatches in either direction can have negative consequences. Children who overestimate their competencies are apt to become demoralized through repeated failure at tasks beyond their capability level, whereas those who underestimate what they can do may shun tasks and thereby preclude opportunities for skill development.

Accurate self-appraisal is influenced by the veridicality of the information on which it is based (Bandura, in press). Self-appraisal should benefit from effort attribution linked to prior achievement because such attribution should lead to more activity experience, which should facilitate comprehension of the operations and standards required to succeed at the task. Such comprehension should provide children with a sound basis for judging their capability. Additionally, linking attribution with prior achievement makes effort a salient cue on which to base perceived efficacy. Persons may be more likely to notice they require less effort to succeed, which indicates greater competence, or that the task remains arduous, which indicates a lack of skill. Self-appraisal should not be as accurate when effort attribution is linked with future achievement because greater task engagement may not result or the covariation between more effort expended and greater achievement may not occur.

The focus of the present study was children's mastery of arithmetic operations in which they initially displayed low achievement. The treatment consisted

of providing children with instructional material and opportunities to practice solving problems under conditions involving attribution for prior achievement, attribution for future achievement, or no attribution. Based on the preceding discussion, it was predicted that attributing children's prior achievement to effort would be most effective in fostering task involvement, skill development, persistence, judgments of self-efficacy, and accuracy of self-appraisal. It was also predicted that attributing children's future accomplishments to effort would not promote achievement behaviors as compared with no attribution.

Method

Subjects were 40 children ($M = 9.1$ years) drawn from two elementary schools. The 26 males and 14 females were predominantly middle class. Teachers initially identified children who lacked subtraction skills. Those children were administered the pretest individually by an adult tester. The pretest measured subtraction skill, persistence, and self-efficacy.

The skill test contained 25 problems that ranged from two to six columns. These problems tapped the subtraction operations presented during training. The tester presented the problems to children one at a time with verbal instructions to examine each problem and to place the problem on a completed stack when they were through solving it or had chosen not to work it any longer. The tester recorded the time children spent with each problem.

Self-efficacy was measured after the skill test to insure familiarity with the problem forms. The efficacy scale ranged from 10 to 100 in intervals of 10 with the following descriptors: 10--not sure, 40--maybe, 70--pretty sure, 100--real sure. Children first performed a practice task to familiarize themselves with the scale format. Following this practice, the tester briefly showed child-

ren 25 pairs of problems. These corresponded in form to those on the preceding skill test but were not identical. For each pair, children privately judged their capability to solve the type of problem depicted.

Following the pretest, children were randomly assigned within sex to one of four treatment groups (prior attribution, future attribution, monitoring, training control). On separate days, children received three, 40-minute training sessions. Seven sets of instructional material constituted the training packet, which was developed in conjunction with previous research (Bandura & Schunk, in press). The packet incorporated several subtraction operations: subtracting a number from a larger one; subtracting zero; subtracting a number from itself; borrowing once and twice; borrowing caused by a zero; and borrowing from zeros.

The format of each set was identical. The first page contained written explanation of the relevant operations along with two step-by-step, worked examples. Each of the next six pages contained several problems for children to solve. Children were brought individually by an adult proctor at slightly staggered times and were seated at desks spread out over a large area. These desks faced away from one another to preclude visual contact, and were sufficiently separated so that children could not overhear the proctor's comments to other children. The proctor placed the entire instructional packet face down on the desk and turned over the first page, which explained the subtraction operations for the first 6-page set. Children were informed that whenever they came to a similar explanatory page they were to bring it to the proctor. The proctor then read the narrative on this page while pointing to the worked examples. If children asked for further assistance, the proctor simply

reread the relevant section of the explanatory page but did not supplement it in any way. The proctor stressed the importance of children working the problems on their own, and then retired to a location that was out of sight of all children. Since the importance of individual work was stressed, children rarely sought the proctor's attention during the sessions except for the obligatory reading of explanatory pages.

The instructions, format, and materials were identical across treatments; only the attribution varied. The proctor monitored the progress of prior attribution children every 8 minutes during each treatment session by walking up to the child and asking, "What page are you working on?" After children replied with the page number, the proctor linked prior achievement with effort by remarking, "You've been working hard." This remark was given matter-of-factly and without accompanying social reinforcement. The proctor then departed. This procedure was identical for future attribution children except that the proctor linked future achievement with effort by remarking, "You need to work hard," after the child replied with the page number. Children in the monitoring group were monitored in the same fashion as the attribution treatments except that the proctor immediately departed without comment after the child replied with the page number. This group controlled for the effects of monitoring included in the attribution treatments. Finally, the training control group served as a control for exposure to the training procedures since it was expected that training alone would promote achievement to some extent. These children were not monitored and had contact with the proctor only during reading of explanatory pages.

The posttest was administered the day following the third training session.

It was identical to the pretest except that a parallel form of the skill test was used and self-efficacy was measured before and after the skill test.

Results

Subtraction problems were scored as correct if children correctly applied the proper operations. Self-efficacy judgments were summed and divided by the total number of judgments to arrive at a mean score. Persistence times were summed and averaged within two levels of difficulty. Low-difficulty problems ($n = 15$) required at most one borrowing, while high-difficulty problems ($n = 10$) required at least double borrowing. These measures are more refined than an aggregate score, because as children develop skills they may spend less time on easier problems and more time on difficult problems. The self-appraisal measure was computed by comparing each posttest self-efficacy judgment collected prior to the skill test with the outcome on the comparable skill-test problem. Accurate self-appraisal was defined as children judging they could solve a particular type of problem and subsequently solving the corresponding exemplar or judging that they could not solve a particular type of problem and subsequently not solving the exemplar. Judgments in the upper half of the efficacy scale (above 50) were scored as efficacious.

No significant sex differences were found on any pre- or posttest measure. The data were therefore pooled across sex for the analyses. There were also no reliable differences between experimental conditions on any pretest measure. Analysis of variance procedures were applied to the posttest measures with the four experimental groups constituting the treatment factor. Significant F ratios were further analyzed using the Newman-Keuls multiple comparison test (Kirk, 1968). Within each condition, pre- and posttest scores were compared using the t test for

correlated scores (Winer, 1971). Table 1 shows the pre- and posttest means and the significance of intragroup changes.

Insert Table 1 about here

Skill. All groups except monitoring showed significant pre-post increases in subtraction skill. Analysis of variance yielded a significant treatment effect, $F(3,36) = 13.40, p < .001$. Newman-Keuls comparisons showed that prior attribution led to significantly greater subtraction skill than each of the other conditions, which did not reliably differ from one another. The hypothesized superiority of attributing prior achievement to effort in promoting skill was therefore supported.

Persistence. As children become more skillful they may spend less time on easier problems. Analysis of pre-post differences found this prediction supported only for training control children. There were no reliable between-group differences on this measure. Conversely, as children become more skillful they should spend more time on difficult problems. Although prior-attribution children showed the greatest increase in persistence, this change only approached significance ($p < .11$). There also were no reliable between-group differences on this measure. It appears, therefore, that having had training, children attempted to solve most of the problems.

Self-efficacy. To determine the effects of treatment on self-efficacy, pretest scores were compared to posttest scores collected prior to the skill test. As Table 1 shows, only the prior-attribution condition showed a significant increase in self-efficacy. Analysis of variance using these posttest scores re-

vealed a significant treatment effect, $F(3,36) = 11.76$, $p < .001$. Prior-attribution children judged their arithmetic efficacy significantly higher than did children in each of the other three groups, which did not differ from one another. No significant intragroup changes were found when posttest scores collected before the skill test were compared to those collected after it; therefore, children's percepts of efficacy were not changed by test performance. Using the latter self-efficacy scores, a significant treatment effect was found, $F(3,36) = 8.15$, $p < .001$, in favor of prior attribution. The hypothesis that attribution for prior achievement would best promote self-efficacy was therefore supported.

Training Progress. If attribution for prior achievement leads to more sustained task involvement, then these children should have completed the most material during training. Out of a total of 42 pages of practice problems, prior-attribution children averaged 81% complete. The comparable figures for other groups were 58% for monitoring, 50% for future attribution, and 46% for training control. Analysis of variance found this difference to be significant, $F(3,36) = 3.16$, $p < .05$. Newman-Keuls comparisons showed that prior-attribution children made significantly greater progress than did future-attribution and training-control children, but the progress of prior-attribution and monitoring children did not differ.

Accuracy of self-appraisal. Pretest correspondence between efficacy judgments and skillful performance is not included because it is postdictive since efficacy judgments were collected after the skill test. Analysis of variance of the posttest self-appraisal indices yielded a significant treatment effect, $F(3,36) = 8.87$, $p < .001$. Newman-Keuls comparisons showed that attributing prior

achievement to effort fostered more accurate self-appraisal than did any of the other treatments; these did not differ from one another. The prediction that prior attribution would lead to the most accurate self-appraisal was therefore supported.

Discussion

The present study provides evidence that attributing prior achievement to effort promotes task involvement, skill development, and perceived efficacy. Conversely, stressing the value of future effort to children does not promote achievement behaviors over what can be expected through merely providing training. These findings are consistent with predictions from self-efficacy theory (Bandura, 1977, in press). Past performance provides authentic information for judging personal capabilities; successes raise self-efficacy while failures lower it. Suggestions that expenditure of effort produced achievement further validate personal efficaciousness. Conversely, linking effort to future attainments is really a form of persuasion. Not only does the impact of such information rely on the credibility of the persuader, but if task experience provides disputing evidence, children may discount the adult's statements as reflecting a lack of understanding of the task demands. The present findings are consistent with evidence showing that changes in children's academic achievements brought about by direct persuasion are small and ephemeral (Miller, Brickman, & Bolen, 1975).

Although the present results demonstrate important differences in achievement behaviors due to how effort is linked with achievement, they do not fully explain the mechanism by which these effects occur. In fact, effort attribution

may have complex effects. For example, it is possible that the two forms of attribution differ in social reinforcement value. Thus, attribution for prior achievement may indicate approval to some children, while attribution for future achievement may convey disapproval to some children in that group. Although steps were taken in the present study to minimize this possibility—proctors gave both remarks objectively—some children could have interpreted the remarks in this fashion.

A second complexity stems from the possibility that the two forms of attribution may differ in the type of performance feedback they provide to children. To some children, attribution for prior achievement may convey success, while to others, attribution for future achievement may convey difficulty. Again, the present procedures attempted to minimize this possibility by insuring that all children would experience success at the task. On the other hand, children had no normative basis for judging their progress, so it is possible that telling them they have been working hard conveyed that they were doing well whereas telling them they need to work hard conveyed that they were doing poorly. One possibility for future research would be to include a treatment that combines both types of attribution, such as, "If you keep working this hard you'll do really well."

A third complexity relates to the idea that effort attribution is most effective with tasks perceived as intermediate in difficulty (Kukla, 1972b; Weiner, Heckhausen, Meyer, & Cook, 1972). Steps were taken in the present study to promote the perception of intermediate difficulty: Although the problems became objectively more difficult, children drew on the operations they

had learned previously and they understood that the problems in each set were like those demonstrated on the accompanying explanatory page. To the extent that prior-attribution children perceived the task as intermediate in difficulty, the validity of the attribution was enhanced. However, if some children in the future-attribution condition concluded that they were not doing well, this may have promoted the perception of greater task difficulty. Therefore, some of these children might have been reluctant to expend greater effort since it might not necessarily speed progress.

The obtained differences in accuracy of self-appraisal cannot be due to behavioral sources of efficacy information since all groups had equal treatment time and ample opportunities to observe their progress. It may be that effort attribution is more informative of personal capabilities than no attribution (Kukla, 1972a), especially in the absence of normative information. When subjects are given no attribution, they are left with more ambiguous information and must construe the task on their own.

But this does not explain the difference between the two attribution conditions. One possibility is that attribution linked to personal experiences is more informative than attribution directed toward the future. Another possibility is that when students perceive their ability as high they demonstrate fewer self-serving biases in judging their capabilities, whereas when they perceive their ability as low they may judge their capabilities unrealistically high so that failure does not necessarily implicate deficient ability (Covington & Omelich, 1979). Since prior-attribution children demonstrated higher posttest skill, they may have felt more certain about their capabilities

than future-attribution subjects.

This research raises several questions. How do children cognitively appraise effort information directed toward them? How do these cognitions influence self-appraisal? Future research should clarify the mechanism through which effort attribution operates to influence achievement behaviors and perceptions of them.

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Table 1

Pre- and Posttest Means by Phase and Experimental Condition

Measure	Phase	Experimental Condition			
		Prior Attribution	Future Attribution	Monitoring	Training Control
Skill ^a	Pretest	1.9	2.0	1.5	1.2
	Posttest	17.3**	6.4*	5.1	2.7*
Persistence - Low Difficulty ^b	Pretest	23.2	25.8	27.0	33.1
	Posttest	20.2	23.7	25.4	20.8*
Persistence - High Difficulty ^b	Pretest	22.2	23.2	23.1	25.6
	Posttest	30.6	24.0	25.1	20.5
Self-Efficacy ^c	Pretest	44.3	47.4	48.8	49.8
	Posttest ^d	82.3**	52.8	60.5	53.4
	Posttest ^e	85.5	55.4	55.8	55.4
Self-Appraisal ^f	Posttest	77.2	53.6	47.8	51.2

Note. $N = 40$; $n = 10$.

^aNumber of accurate solutions on 25 problems.

^bAverage number of seconds per problem.

^cAverage judgment: range of scale 10 (low) - 100.

^dMeasured before the skill test.

^eMeasured after the skill test.

^fAverage percentage of agreement between Posttest^d efficacy scores and skill scores.

* $p < .05$

** $p < .01$